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Diversity of plant knowledge in a *"Caiçara"* community from the Brazilian Atlantic Forest coast[1]

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RESUMO

(Diversidade do conhecimento de plantas em uma comunidade *"Caiçara"* da Mata Atlântica brasileira). Há um número crescente de publicações sobre populações *Caiçaras*, o que revela o interesse dos pesquisadores sobre esses grupos. Este estudo teve como objetivo investigar a flora utilizada pelos especialistas da comunidade *Caiçara* da Praia do Sono, registrando a forma de uso desses táxons e procurando perceber os sistemas tradicionais de manejo que visam conservar os ecossistemas naturais. Doze informantes foram selecionados e entrevistados. A análise de agrupamento realizada juntamente com o teste *qui-quadrado* evidenciaram que o conhecimento etnobotânico mostra-se heterogeneamente distribuído, ao se considerar o gênero dos entrevistados. 190 táxons foram indicados e encontram-se ordenados em 9 categorias de usos. O índice de Shannon-Wiener (*H'*) obtido neste estudo foi o segundo mais alto quando comparado com o das demais comunidades costeiras do Brasil. Este trabalho constatou que os informantes da Praia do Sono preservam um amplo conhecimento sobre os recursos vegetais que os cercam e com os quais mantêm grande intimidade. Este conhecimento não é só importante, mas fundamental nas discussões sobre a aplicação de usos sustentáveis e estratégias de conservação para esta área.

Palavras-chave: Mata Atlântica, *Caiçaras*, Conservação, Etnobotânica, Plantas úteis

ABSTRACT

(Diversity of plant knowledge in a "*Caiçara*" community from the Brazilian Atlantic Forest coast). The number of publications about the *Caiçaras* population is growing, which shows that researchers are interested in these natives. This study aimed to survey the flora used by local specialists of the Praia do Sono *Caiçara* community, and recorded how these taxa were used, with the goal of understanding traditional management systems that help to conserve natural ecosystems. Twelve informants were selected and interviewed. The applied grouping analysis, together with the *chi-squared* test, underlined that the analysed ethnobotanical knowledge showed a heterogeneous distribution in relation to the gender of the interviewee. A total of 190 taxa were cited and were classified into nine usage categories. The Shannon-Wiener index (*H'*) value obtained in this study was the second highest in comparison to other Brazilian coastal communities. This work showed that the local specialists of this *Caiçara* community maintain a wide knowledge of, and affinity to, the plant resources that surround them. This knowledge is not only important, but fundamental to discussions about the application of sustainable use and management strategies for this area of conservation value.

Keywords: Atlantic Forest, *Caiçaras*, Conservation, Ethnobotany, Useful plants

Introduction

Since the discovery of Brazil, the Atlantic Forest has been influenced by a large number of human disturbances (Tabarelli *et al.* 2010). The dramatic devastation of the richness and diversity of this region has, over the years, promoted the disappearance of several species and caused hundreds of others to come under pressure of extinction (Ribeiro *et al.* 2009). Because of its indisputable importance for human survival, combined with the numerous threats that it has been suffering from, the conservation of the biodiversity of the Atlantic Forest has been the focus of several studies, whose arguments in its defence include environmental, political-economic, ethnic, aesthetic and utilitarian dimensions (Hanazaki 2003). According to Diegues & Arruda (2001), the knowledge of local populations is, in some countries,

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considered to be the primary focus in discussions about conservation issues.

This research was conducted in a community that is recognized as belonging to the "*Caiçara* cultural type". The *Caiçara* culture appeared in the Atlantic Forest, more specifically the coastal states of São Paulo, Rio de Janeiro and Paraná, as a result of miscegenation between indigenous populations, Portuguese colonizers and, to a lesser degree, Africans slaves (Sanches 2004). Survival of the family unit is based on the activities of cutting and burning, itinerant agriculture, fishing and extraction of resources from the environment (Begossi 1998). According to Hanazaki (2003), these natives play a major role in the conservation of the Atlantic Forest, due to their vast knowledge of the environment, which has accumulated over many generations and could be transformed into a valuable ally in the search for improving the quality of life of several populations.

This study aimed to survey the flora used by local specialists of the Praia do Sono *Caiçara* community, by recording how these taxa are used, with the goal of understanding traditional management systems that help to conserve natural ecosystems. Taking into account that the study group interacts directly with the Atlantic Forest biome, accumulating extensive knowledge about the native plant species, we sought to analyse and to describe how knowledge about the use of plants is distributed among the interviewees, and to group the cited species into categories of usage.

Materials and methods

Study area

The Praia do Sono *Caiçara* community is located on a beach called Praia do Sono, inside the Ecological Reserve of Juatinga, which is within the Environmental Preservation Area of Cairuçu, Paraty Municipality, in the state of Rio de Janeiro. The community is located at the coordinates 23°19' 55.2° S and 44º 37' 57.8° W and occupies an area that is 1365 metres long.

The Ecological Reserve of Juatinga is home to twelve traditional populations, distributed along the coast in five main centres: Praia do Sono, Ponta Negra, Praia Grande do Pouso da Cajaíba, Ponta da Juatinga, and Mamanguá (SEMADS-RJ 2001).

Data collection

The fieldwork was undertaken between February 2008 and June 2009, with monthly inspections. The "snowball" technique was applied in order to get a list of local specialist informants. The data were obtained through the techniques of "direct observation", "participatory observation" and "semi-structured interviews" (Albuquerque *et al.* 2008).

Samplings were carried out in the woods, guided by five of the six local men who participated in the survey, using the forest sections most frequented by them (Alexiades & Sheldon 1996). The useful species present on the beach, and those cultivated in the backyards of the local informants were also collected; however, these areas were covered for all 12 informants interviewed.

All botanical material collected was deposited in the herbarium of Museu Nacional do Rio de Janeiro (R). The identification of botanical material was undertaken using the literature, by comparison with specimens from the herbaria at the Museu Nacional (R) and Jardim Botânico do Rio de Janeiro (RB), as well as with the help of specialists.

Data analysis

Level of similarity of knowledge between genders was assessed using cluster analysis based on the known species provided by each informant. Sorensen's coefficient was calculated, and the connection method UPGMA was used. Informants' knowledge of plant diversity by gender was statistically compared using the *t*-test.

The *chi-square* test was used to evaluate if the difference in knowledge about the uses of plants between genders was significant.

In order to classify the origin of the plants collected, we adopted the following definitions: native plants (those belonging to the Atlantic Forest domain) and exotic plants (species originating in other areas). For this purpose we consulted Corrêa (1926-1978) and Stehmann *et al.* (2009).

Sampling effort was measured by adjustment of the straight simple linear regression line calculated from the accumulation of species' richness (Whittaker 1975), according to the cumulative number of observations (Loss & Silva 2005) corresponding to the sequential insertion of interviews.

The Shannon-Wiener diversity index (Begossi 1996) was calculated to compare data from this study with results originating from ethnobotanical research carried out in different communities along the Brazilian coast.

The uses mentioned were categorized according to those proposed by Prance *et al.* (1987) and Phillips & Gentry (1993), with a few adaptations to fit the context of the present study, but always respecting the information provided by the local specialist interviewed and attempting to minimize potential distortions. The uses mentioned by the informants were classified into nine general categories (Table 1).

All statistical analyses were performed using the program PAST v1.34 (Hammer *et al.* 2001).

Results and discussion

Knowledge distribution

Twelve informants (n = 12) were interviewed, each with knowledge of the local vegetation. The informants were between 29 and 88 years old and there were six men and six women. Ten are native to Praia do Sono, and two came from surrounding regions but have resided in the community for over 50 years.

Table 1. The usage categories of the species indicated by local specialists of the Praia do Sono *Caiçara* community and their corresponding descriptions.

Usage Categories	Description Categories
Food	Cited as "plant to eat" and "plant for seasoning"
Construction	Used on house building, ranch building (rafters, sleepers, roof shingles, mooring, etc.) and fence posts
Fuelwood	Cited as "wood to burn"
Medicinal	Cited as "plant to remedy"
Ornamental	Plants used to decorate backyards and homes
Ritualistic	Plants used in baths to "take of the evil eye" and "open the way" and cultivated around homes to "drive away the evil eye"
Tecnological	Used in the creation of objects for domestic use, recreational or to build furniture, canoes, etc
Veterinary	Used for infestation of lice in farmed animals
Others	Its known good for "shade", "bird food" and "repellent"

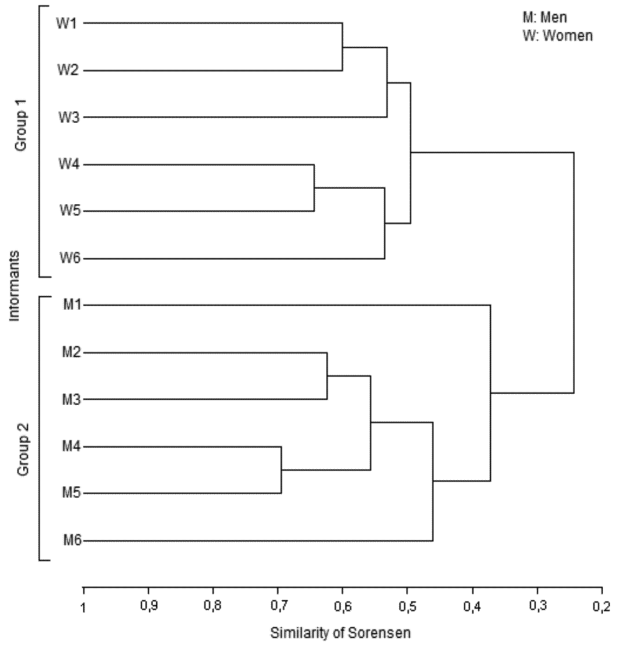

Figure 1. Analysis of similarity of knowledge regarding the use of plant resources among the informants of the Praia do Sono *Caiçara* community.

Investigation of similarities in terms of knowledge about plant resource uses, from the dendrogram produced from the matrix of presence/absence of each species mentioned by each informant, showed a significant adjustment to the calculated matrix of coefficients (rcs = 0.8944) and formed two separate groups clearly separating the genders. This indicated that there is a preference in the use of certain species by both men and women (Fig. 1). However, when the diversity of these plants was evaluated between both genders, using the *t*-test, this difference did not appear significant ($P = 0.2507$). Therefore, men and women have some preference regarding plant use, and share similar values about plant diversity.

The first group shown in the dendrogram consisted of the six women interviewed; the main activities carried out by them are related to maintenance and home care, including child rearing, food preparation, cleaning and tidying the house, attention to the backyard and managing small livestock. The role they play in the social organization of the community gives them a better understanding of the species used for medicinal purposes, food, ornamental and veterinary purposes, these being the factors responsible for this grouping. The second group was formed of the six men who participated in the survey, who are responsible for functions related to hunting and fishing, construction of houses, supply of firewood, etc. These specialists stand out in terms of knowledge about plants native to the Atlantic Forest, especially those with an arboreal habit included in the usage categories construction, fuelwood and technological. The results corroborate with Laraia (2002), affirming that humans are shaped by the cultural environment in which they are socialized. As recorded by Miranda & Hanazaki (2008), the cluster analysis yielded promising results for the understanding of indigenous knowledge about plants, explaining the intricacies and subtleties that are present in the relations between the studied group and the plant resources.

A *chi-square* test verified that there is a difference between genders in knowledge about the use of plants ($X^2 = 477.47$; df = 8; $P < 0.0001$). The main reason for this difference is the large number of species utilized in the usage categories for medicinal and veterinary purposes cited by female informants, and in the significant number of species in the construction, fuelwood and technological categories, cited by male informants (Fig. 2). Hanazaki *et al.* (2000) studied two *Caiçaras* communities in São Paulo state, and also showed that knowledge about plants differs according to the gender, especially in relation to plants used in the technological category.

Data on plant species

We obtained indications of 215 ethnospecies for various purposes. From this, a total of 190 taxa were identified (Tab. 2). The plants noted in Table 2 are distributed across 61 botanical families, with the highest number of species being represented by Fabaceae (14 spp.), Poaceae (13 spp.), Lamiaceae (11 spp.) and Myrtaceae (11 spp.).

Considering the origin of the species, the informants in the present study mentioned 108 native species and 82 exotic species. Miranda & Hanazaki (2008) studied the

Table 2. List of species cited as useful by the local specialists of the Praia do Sono *Caiçara* community. Family/Scientific name. Local name. Habit: Ar-arboreal, Hb-herb, Sh-shrub, Vi-vine. Usage categories: food-food, cons-construction, fue-fuelwood, med-medicinal, orn-ornamental, rit-ritualistic, tec- tecnological, vet--veterinary, oth-others/ Part used: ap-aerial part, c-crown, fl-flower, fr-fruit, i-inflorescence, l-leaf, m-mucilage, r-root, s-seed, st-stem, wp-whole plant. Origin and Collection location (O/Loc): N-native to the Atlantic Forest domain, E-exotic to the biome, B-backyards, F-forest, Bea-beach.

Family/Scientific name	Local name	Habit	Usage categories / Part used	O/Loc
Alismataceae				
Echinodorus grandiflorus Mitch.	chapéu-de-couro	Hb	med (l)	N/B
Amaranthaceae				
Alternanthera brasiliana (L.) O. Kuntze	terramicina	Hb	med (l)	N/B
Iresine herbstii Hook.	arnica; paraguaia	Hb	med; orn (l)	E/B
Amaryllidaceae				
Allium cepa L.	cebola	Hb	food (st)	E/B
Allium fistulosum L.	cebolinha	Hb	food (l)	E/B
Allium sativum L.	alho	Hb	food; med (st)	E/B
Anacardiaceae				
Anacardium occidentale L.	cajú	Sh	food; med (fr)	N/B
Mangifera indica L.	manga	Sh	food (fr); med (l)	E/B
Schinus terebinthifolius Raddi	aroeira	Sh	cons; med; tec (st); oth (fr)	N/Bea
Spondias mombin L.	cajá	Sh	food (fr)	N/B
Tapirira guianensis Aubl.	canafístula; cupiuva	Sh	cons; tec (st)	N/F
Annonaceae				
Guatteria australis A.St.-Hil.	bicuíba	Sh	med (fr)	N/F
Rollinia mucosa (Jacq.) Baill.	condessa	Sh	food (fr)	N/B
Apiaceae				
Coriandrum sativum L.	coentro	Hb	food (l)	E/B
Eryngium foetidum L.	coentro-bravo; coentrão	Hb	food (l)	N/B
Petroselinum crispum (Mill.) A. W. Hill	salsa	Hb	food (l)	E/B
Apocynaceae				
Catharanthus roseus (L.) G. Don	boa-noite	Hb	orn (ap)	E/B
Araceae				
Anthurium sp.	cipó-imbé	Vi	cons; tec (st)	N/F
Colocasia esculenta Schott	inhame	Hb	food (st)	E/B
Heteropsis salicifolia Kunth	timbupeba	Vi	cons; tec (st)	N/F
Arecaceae				
Astrocaryum aculeatissimum (Schott) Burret	côco-preto	Sh	food (fr)	N/F
Attalea dubia (Mart.) Burret	indaiá	Sh	food (fr)	N/F
Bactris setosa Mart.	côco-de-natal; tucum	Sh	food (fr)	N/F
Cocos nucifera L.	côco	Sh	food (fr)	E/B
Euterpe edulis Mart.	jiçara; juçara	Sh	food; cons (st)	N/F
Syagrus pseudococus (Raddi) Glassman	pati	Sh	cons; tec (st)	N/F
Asparagaceae				
Aloe vera (L.) Burm. f.	babosa	Hb	med (m)	E/B
Asteraceae				
Achyrocline satureoides (Lam.) DC.	camomila; macela	Hb	med (i)	N/F
Ageratum conyzoides L.	erva-de-são-joão	Hb	med (wp)	N/B
Baccharis dracunculifolia DC.	vassoura-de-alecrim	Hb	tec (ap)	N/F
Baccharis trimera (Less.) DC.	carqueja	Hb	med (st)	E/B
Bidens pilosa L.	picão	Hb	med (wp)	N/B
Lactuca sativa L.	alface	Hb	food (l)	E/B
Mikania glomerata Spreng.	guaco	Vi	med (l)	N/B
Vernonia beyrichii Less.	cambará-roxo	Sh	med (l)	N/F
Vernonia polyanthes Less.	assa-peixe	Ar	med (l)	E/B
Bignoniaceae				
Crescentia cujete L.	cabaço	Ar	fue (st); med; tec (fr)	E/B
Tabebuia cassinoides (Lam.) DC.	caxeta	Ar	tec (st)	N/F
Tabebuia heptaphylla (Vell.) Toledo	ipê	Ar	cons; tec (st)	N/F
Sparattosperma leucanthum (Vell.) K. Schum	ipê-da-capoeira	Ar	cons (st)	N/F

Continues

Table 2. Continuation.

Family/Scientific name	Local name	Habit	Usage categories / Part used	O/Loc
Boraginaceae				
Cordia verbenacea DC.	baleeira	Sh	med (l)	E/B
Brassicaceae				
Brassica oleracea L. var. *acephala* D.C.	couve	Hb	food; med (l)	E/B
Bromeliaceae				
Ananas comosus (L.) Merr.	abacaxi	Hb	food; med (fr)	E/B
Caricaceae				
Carica papaya L.	mamão-macho	Ar	med (fl)	E/B
Cecropiaceae				
Cecropia pachystachya Trec.	baibera; imbaíba	Ar	fue; tec (st); med (l)	N/F;B
Chenopodiaceae				
Chenopodium ambrosioides L.	santa-maria	Hb	med; vet (ap)	E/B
Chrysobalanaceae				
Hirtella hebeclada Moric. Ex DC.	simbiíba; simbiúva	Ar	cons; fue (st)	N/F
Clusiaceae				
Clusia lanceolata Cambess.	cebola-da-praia	Ar	orn (ap); oth (fr)	N/F
Combretaceae				
Terminalia catappa L.	amendoeira	Ar	food (fr); fue; cons (st); oth (c)	E/Bea
Convovulaceae				
Ipomea batatas (L.) Lam.	batata-doce	Hb	food; med (r)	E/B
Costaceae				
Costus spicatus (Jacq.) Sw.	cana-do-brejo	Hb	med (l)	N/B
Crassualceae				
Bryophyllum pinnatum (L. f.) Oken	estalo	Hb	med (l)	E/F;B
Kalanchoe brasiliensis Cambess	saião	Hb	med (l)	N/B
Crucifera				
Nasturtium officinale R. Br.	agrião	Hb	food; med (l)	E/B
Cucurbitaceae				
Cucumis sativus L.	pepino	Hb	food (fr)	E/B
Cucurbita pepo L.	abóbora	Hb	food (fr); med (fl)	E/B
Momordica charantia L.	melão-de-são-caetano	Vi	med (l)	E/B
Sechium edule (Jacq.) Sw.	chuchu	Vi	food (fr); med (l)	E/B
Dilleniaceae				
Davilla rugosa Poiret	cipó-caboclo	Vi	cons; med; tec (st)	N/F
Elaeocarpaceae				
Sloanea guianensis Benth.	guariçica-da-folha-grande	Ar	cons (st)	N/F
Erytroxylaceae				
Erytroxylum ovalifolium peyr.	futiabeira	Ar	med (l)	N/B
Euphorbiaceae				
Alchornea glandulosa Poepp. & Endl.	chichá	Ar	tec (st)	N/F
Aleurites moluccana Willd.	noga	Ar	food; tec (fr)	E/B
Euphorbia prostrata Aiton	quebra-pedra	Hb	med (wp)	N/B
Euphorbia pulcherrima Willd. ex Klotzsch	seis-meis	Sh	orn (ap)	E/B
Hyeronima alchorneoides Fr. Allem.	arecurana; aricurana	Ar	cons; tec (st)	N/F
Mabea brasiliensis Müll. Arg.	canudo	Ar	cons (st)	N/F
Manihot esculenta Crantz	ipi; mandioca	Hb	food (r)	N/B
Pera glabrata (Schott) Baill.	chile; casca-preta	Ar	fue; cons (st)	N/F
Ricinus communis L.	mamona	Sh	food; tec (fr); med (l)	E/B
Sapium sp.	tarumã	Ar	tec (st)	N/F

Continues

Table 2. Continuation.

Family/Scientific name	Local name	Habit	Usage categories / Part used	O/Loc
Fabaceae				
Cajanus cajan (L.) Millsp.	feijão-guandu	Sh	food (fr); med (l)	E/B
Desmodium adscendens (SW.) DC.	carrapichinho	Hb	med (wp)	N/F
Hymenaea courbaril L.	jatobá	Ar	cons; med (st)	N/F
Inga lanceifolia Benth.	cabriúba; cambriúba	Ar	cons (st)	N/F
Inga striata Benth.	ingá	Ar	food (fr); cons (st)	N/F
Inga vera Willd.	ingá	Ar	food (fr); cons (st)	N/F
Mimosa pudica L.	dormideira	Hb	med; rit (wp)	N/B
Myrocarpus frondosus Fr. Allem.	cabriúba-vermelha	Ar	cons; tec (st)	N/F
Phaseolus vulgaris L.	feijão	Hb	food (fr)	E/B
Piptadenia gonoacantha (Mart.) Macbr.	cobi	Ar	tec (st)	N/F
Schizolobium parahyba (Vell.) Blake	garapubu	Ar	tec (st)	N/F
Senna multijuga Rich. I. & B.	aleluia	Ar	fue (st); orn (wp)	N/F
Swartzia myrtifolia var. *elegans* (Schott) R. S. Cowan	laranjeira-do-mato	Ar	cons (st)	N/F
Tachigali paratyensis (Vell.) H. C. Lima	ingá-de-flecha	Ar	tec (st)	N/F
Lamiaceae				
Leonotis nepetaefolia (L.) R. Br.	cordão-de-frade	Hb	med (l); rit (wp)	E/B
Leonurus sibiricus L.	santa-rita	Hb	med (wp)	E/B
Marsypianthes chamaedrys (Vahl.) Kuntze	erva-madre	Hb	med (wp)	N/B
Mentha pulegium L.	poejo	Hb	med (wp)	E/B
Mentha sativa L.	hortelã-de-bicho; hortelã-miúdo; hortelã	Hb	food; med (l)	E/B
Ocimum basilicum L.	manjericão	Hb	food; med (l)	E/B
Ocimum selloi Benth.	alfavaca	Hb	food; med (l)	N/B
Plectranthus amboinicus (Lour.) Spreng.	hortelã-de-galinha	Hb	food; med (l)	E/B
Plectranthus barbatus Andrews	boldo	Hb	med (l)	E/B
Plectranthus ornatus Codd.	anador	Hb	med (l)	E/B
Rosmarinus officinalis L.	alecrim	Hb	food; med (l)	E/B
Lauraceae				
Laurus nobilis L.	louro	Ar	food; med (l)	E/B
Ocotea sp.	canela	Ar	cons (st)	N/F
Persea americana Mill.	abacate	Ar	food (fr); med (l)	E/B
Lecythidaceae				
Cariniana estrellensis (Raddi) Kuntze	jequitibá	Ar	med; tec (st)	N/F
Couratari pyramidata (Vell.) R. Knuth	sapucaia-de-esqueiro	Ar	cons (st); tec (r)	N/F
Lecythis pisonis Camb.	sapucaia-de-côco	Ar	cons (st)	N/F
Loranthaceae				
Struthanthus concinnus Mart.	erva-de-passarinho	Vi	med (l)	N/B
Lytraceae				
Punica granatum L.	romã	Sh	food; med (fr)	E/B
Malpighiaceae				
Bunchosia armeniaca DC.	cereja	Sh	food (fr)	E/B
Malipighia emarginata Sessé & Moc. Ex DC.	acerola	Sh	food (fr)	E/B
Malvaceae				
Bombacopsis glabra (Pasq.) A. Rob.	castanha	Ar	cons (st)	N/B
Eriotheca sp.	paineira	Ar	cons (st); oth (fr)	N/B
Gossypium herbaceum L.	algodão	Ar	med (l)	E/F
Hibiscus rosa-sinensis L.	mimo	Sh	orn (ap)	E/B
Malvaviscus arboreus Cav.	mimo	Sh	orn (ap)	E/B
Pachira aquatica Aubl.	castanha	Ar	cons (st)	E/B
Pseudobombax grandiflorum (Cav.) A Rob.	castanha	Ar	cons (st)	N/B
Sida planicaulis Cav.	vassoura	Hb	med (l); tec (ap)	N/B
Marantaceae				
Maranta divaricata Roscoe	araruta	Hb	food (r)	N/B

Continues

Table 2. Continuation.

Family/Scientific name	Local name	Habit	Usage categories / Part used	O/Loc
Melastoforestceae				
Leandra melastomoides Raddi	pixirica	Ar	fue (st); oth (fr)	N/F
Miconia cinnamomifolia Triana	jacatirão	Ar	cons (st)	N/F
Miconia dodecandra (Desr.) Cogn.	pixirica	Ar	fue (st); oth (fr)	N/F
Miconia pusilliflora (DC.) Naudin	fruto-de-saíra	Ar	fue; cons (st)	N/F
Tibouchina gaudichaudianum Cogn.	chorão	Ar	fue (st); orn (wp)	N/F
Tibouchina sp.	quaresma	Ar	fue; cons; tec (st)	N/F
Meliaceae				
Cedrela sp.	cedro	Ar	cons; tec (st)	N/F
Guarea macrophylla var. *tuberculata* Vahl.	cabacero	Ar	fue; cons; tec (st)	N/F
Trichilia trigolia var. *ptilaefolia* (A. Juss.) Penn.	guariçica-da-folha-miúda	Ar	cons (st)	N/F
Moraceae				
Artocarpus heterophyllus Lam.	jaca	Ar	food (fr); med (l)	E/B
Ficus glabra Vell.	figueira-branca; figueira	Ar	tec (r); oth (c)	E/B
Morus nigra L.	amora	Ar	food (fr); med (l)	E/B
Sorocea guilleminiana Gaudich	espinheira-santa	Sh	med (l)	N/F
Musaceae				
Musa X paradisiaca L.	banana	Sh	food (fr); med (l)	E/B
Myrtaceae				
Calyptranthes strigipes O. Berg.	guamirim	Ar	fue; cons (st)	N/F
Eucalyptus sp.	eucalipto	Ar	med (l)	E/B
Eugenia tinguyensis Cambess.	araçarana-do-mato	Ar	fue; cons (st)	N/F
Eugenia uniflora L.	pitanga	Ar	food (fr); med; vet (l); tec (st)	N/B
Gomidesia spectabilis (DC.) O. Berg	guamirim-vermelho	Ar	fue; cons (st)	N/F
Myrcia splendens (Sw.) DC.	cambucá-da-mata-virgem	Ar	cons (st)	N/F
Plinia edulis (O. Berg) Nied	cambucá	Ar	food (fr); fue (st); med (l)	N/B
Plinia trunciflora (O. Berg) Kausel	jabuticaba	Ar	food (fr)	N/B
Psidium cattleianum Sabine	araçá	Ar	food (fr)	N/B
Psidium guajava L.	goiaba	Ar	food (fr); med (l)	E/B
Syzygium jambos (L.) Alston	jambo	Ar	food (fr)	E/B
Myrsinaceae				
Rapanea ferruginea (Ruiz & Pav.) Mez	capororoca-da-folha-pequena	Ar	fue; cons (st)	N/F
Nyctaginaceae				
Bougainvillea spectabilis Willd.	carramanchão	Vi	orn (ap)	N/B
Passifloraceae				
Passiflora alata Curtis	maracujá	Vi	food (fr); med (l)	N/B
Passiflora edulis Sims	maracujá	Vi	food (fr); med (l)	N/B
Phyllanthaceae				
Phyllanthus tenellus Roxb.	quebra-pedra	Hb	med (wp)	N/B
Piperaceae				
Piper mollicomum Kunth	joão-borandí	Vi	med (l)	N/B
Piper nigrum L.	pimenta-do-reino	Vi	food (fr)	E/B
Pothomorphe umbellata L.	pariparoba	Vi	med (r)	N/F
Poaceae				
Bambusa trinii Nees	taquara	Ar	tec (st)	N/F
Bambusa tuldoides Munro	bambu-de-gaiola	Ar	fue; cons; tec (st)	E/B
Bambusa vulgaris Schrad. ex J.C. Wendl.	bambú-amarelo	Ar	fue; cons; orn; tec (st)	E/B
Cymbopogum citratus (DC.) Stapf.	capim-cidreira; capim-cidão	Hb	med (l)	E/B
Cymbopogum nardus (L.) Rendle	citronela	Hb	oth (l)	E/B
Dendrocalamus asper (Schult. & Schult. f.) Backer ex K. Heyne	bambú-gigante	Ar	fue; cons; tec (st)	E/B
Eleusine indica (L.) Gaertn.	pé-de-galinha	Hb	med (wp)	E/B
Gynerium sagittatum (Aubl.) P. Beauv.	ubá	Hb	tec (st)	N/F;B
Imperata brasiliensis Trin.	sapê	Hb	cons (l)	N/F
Merostachys ternata Nees	taquara-de-lixa	Sh	tec (st)	N/F
Phyllostachys pubescens Mazel ex J. Houz.	bambú-japonês	Ar	fue; cons; tec (st)	E/B
Saccharum officinarum L.	cana	Sh	food (st)	E/B
Zea mays L.	milho	Hb	food (i)	E/B
Polygalaceae				
Polygala paniculata L.	arnica; gelol	Hb	med (r)	N/B

Continues

Table 2. Continuation.

Family/Scientific name	Local name	Habit	Usage categories / Part used	O/Loc
Rosaceae				
Rosa canina L.	rosa-branca	Sh	med; orn (fl)	E/B
Rubus rosifolius Sm.	amora-de-espinho	Hb	med (wp)	N/F
Rubiaceae				
Coffea arabica L.	café	Sh	food; med (s)	E/B
Rutaceae				
Citrus aurantium L.	laranja-china; laranja-lima	Ar	food (fr); med; vet (l)	E/B
Citrus deliciosa Ten.	laranja-crava; mixirica	Ar	food; oth (fr); med; vet (l)	E/B
Citrus limon (L.) Burm. f.	limão	Ar	food (fr); med; vet (l)	E/B
Citrus reticulata Blanco	pocã	Ar	food (fr); med (l)	E/B
Citrus sinensis (L.) Osbeck	laranja-baía; laranja	Ar	food (fr); med; vet (l)	E/B
Dictyoloma vandellianum Adr. Juss.	tingui	Ar	fue; tec (st)	N/F
Ruta graveolens L.	arruda	Hb	med; rit; vet (l)	E/B
Zanthoxylum rhoifolium Lam.	peito-de-moça; espora-de-galo	Ar	tec (st)	N/F
Sapindaceae				
Cupania furfuraceae Radlk.	cubatã; cubatã-vermelho	Ar	fue; cons; tec (st)	N/F
Cupania oblongifolia Mart.	cubatã-branco	Ar	cons (st)	N/F
Sapotaceae				
Eclinusa ramiflora Mart.	guacá	Ar	tec (st)	N/F
Mimusops commersonii (G. Don) Engl.	abricó-da-praia	Ar	food (fr); oth (cr)	E/Bea
Solanaceae				
Capsicum frutescens L.	pimenta; pimenta-malagueta	Hb	food (fr)	E/B
Lycopersicon esculentum Mill.	tomate	Hb	food (fr)	E/B
Solanum americanum Mill.	maria-preta	Hb	med (l)	N/B
Solanum sisymbrifolium Lam.	rebenta-cavalo	Hb	med (fr)	N/B
Trigoniaceae				
Trigonia nivea var. *nivea* Camb.	cipó-de-paina	Ar	cons (st); tec (s)	N/F
Ulmaceae				
Trema micrantha (L.) Blume	candiúba	Ar	med (st)	N/F
Verbenaceae				
Aegiphila sellowiana Cham.	capororoca-da-folha-grande	Ar	fue; cons (st)	N/F
Lippia alba (Mill.) N. E. Br.	erva-cidreira	Hb	med (l)	N/B
Stachytarpheta cayennensis (Rich.) Vahl.	gervão	Hb	med (wp)	N/B
Verbena tenera Spreng.	jardineira	Hb	orn (fl)	N/B
Vitaceae				
Vitis labrusca L.	uva	Vi	food (fr)	E/B
Zingiberaceae				
Hedychium coronarium J.Koenig	ciosa	Hb	med; orn (fl)	E/B
Zingiber officinale Roscoe	gengibre	Hb	med (st)	E/B

island communities of Cardoso (SP) and Santa Catarina (SC), and recorded 111 native plants and 109 exotic ones. The authors inferred that the communities that mention a greater number of native species reflect an increased interaction with local vegetation, which can be explained by several complementary factors, such as the distance from larger urban centres, difficulty of access, dedication of the residents to tasks involving the environment, and the length of time residents had lived in the community.

The diagram of the sampling effort showed an ascending curve of significant relationships ($r^2 = 0.582$; $P < 0.0001$) between number of interviews and observed richness (Fig. 3), that is, an increase in sampling effort will probably result in an increase in richness. According to Amorozo (2002), knowledge of use of species is influenced by their availability, so in this way a region that has a very rich flora presents a greater number of species that may be used by the local population. The results we obtained corroborate this, which was observed by Amorozo (2002), since the Praia do Sono *Caiçara* community is situated in the Atlantic Forest area, an ecosystem recognized for its species-rich flora.

The prevalent habit among the useful plants was arboreal (95 spp.), 26% of which belonged to the construction category, and 18% to the technological category. Other studies (Albuquerque *et al.* 2005; Cunha & Albuquerque 2006; Alarcon & Peixoto 2008) focussing on knowledge of forest tree species also showed that these uses are generally the most common. According to Christo *et al.* (2006), the high

Table 3. Comparison of diversity indices of Shannon-Wiener (*H'*) in studies conducted in different coastal communities of the Brazilian coast. (NS: number of species; NI: number of informants, NC: number of use citations, H': Shannon-Wiener diversity index).

Study site	NS	NI	NC	H'		References
				base 10	base *e*	
Gamboa, RJ	90	58	558	1.65	-	Figueiredo *et al.* 1993
Chalhaus, RJ	75	42	482	1.53	-	Figueiredo 1997
Arraial do Cabo, RJ	68	15	444	1.78	4.10	Fonseca-Kruel & Peixoto 2004
Martim de Sá, RJ	76	10	355	1.81	-	Borges & Peixoto 2009
Ilha de Búzios, SP	128	56	-	1.57	-	Begossi *et al.* 1993
Beach do Puruba, SP	124	22	414	1.92	-	Rossato *et al.* 1999
Sertão do Puruba, SP	140	28	525	1.92	-	Rossato *et al.* 1999
Picinguaba, SP	216	83	1552	2.06	-	Rossato *et al.* 1999
Casa de Farinha, SP	108	18	393	1.85	-	Rossato *et al.* 1999
Ilha de Vitória, SP	57	11	195	1.61	-	Rossato *et al.* 1999
Ponta do Almada, SP	152	45	434	1.99	4.59	Hanazaki *et al.* 2000
Beach de Camburí, SP	162	57	541	1.98	4.57	Hanazaki *et al.* 2000
Pereirinha e Itacuruçá, SP	124	20	473	2.04	-	Miranda & Hanazaki 2008
Foles e Cambriú, SP	86	31	340	1.83	-	Miranda & Hanazaki 2008
Naufragados, SC	93	12	190	1.90	-	Miranda & Hanazaki 2008
Guaraqueçaba, PR	445	90	3400	2.38	5.48	Lima *et al.* 2000
Praia do Sono, RJ	**190**	**12**	**1341**	**2.18**	**5.03**	**This study**

percentage of tree species utilized, mainly in the construction and technological categories, reaffirms the importance of these types of uses of Atlantic Forest resources, while at the same time demands care, because the collection of these resources may cause damage to the conservation of species.

From the 190 species listed and collected, 61% were sourced from the backyards of the interviewees, 37% from the forest, and 2% were found on the beach. The plants present in the backyards of the informants were used, as their main purpose, to promote health, nutrition and wellness, given most species from this environment were from the medicinal usage (76 spp.), nutritional (59 spp.) and ornamental (10 spp.) categories. Guarim Neto & Carniello (2008) also found several plants in backyards with the potential to supply part of the basic needs of the family.

We found that backyards are usually tended by women and older family members, who interact more intensively with the children of the community. Thus, one can assume that the backyard is a potential space for the maintenance and transmission of traditional knowledge, given the opportunities for passing it to the next generation. Guarim Neto & Carniello (2008) believe that, although having a reduced land area, the backyard brings together a vegetal grouping with intricate cultural manifestation, involving plant origin, handling and utilization.

Lima *et al.* (2000) report that high values of the Shannon-Wiener (*H'*) index, in general, relate to areas reasonably well-preserved and associated with populations having significant ethnobotanical knowledge. The Shannon-Wiener (*H'*) index obtained in this study was 2.18 (base 10) and 5.03 (base *e*). When this index is compared with other communities studied, the Praia do Sono informants are the second highest according to this parameter (Tab. 3), indicating that the specialists informants of Praia do Sono have great knowledge about the use of plant resources. However, it is important to note that other authors, with the exception of Fonseca-Kruel & Peixoto (2004) and Borges & Peixoto (2009), did not work with local specialists, but with a random sampling, superior numbers to the group we identified as the local specialists, as they attempted to cover the community as a whole.

Hanazaki *et al.* (2000), in analysing the rates of Shannon-Wiener (*H'*) index diversity in different *Caiçara* communities of the Atlantic Forest, were able to perceive some general patterns. The largest diversity was found in communities located on the continent, when compared to that found on the islands (Gamboa, Chalhaus, Búzios Island and Victoria Island). Rossato *et al.* (1999) discuss this tendency in the context of the theory of island biogeography (MacArthur & Wilson 1967), whereby one expects to find a lower diversity of species on islands than in continental areas.

Usage categories

Grouping plants into nine categories according to their use revealed a high number of taxa indicated for medical purposes (89 spp.), followed by food use (67 spp.) and construction (48 spp.) (Tab. 2).

Of the 67 species listed for food uses, 48 were exotic and 19 native. Most of the plants (59 spp.) were present in the backyards of the informants, which demonstrated the large dependence of the residents of Praia do Sono on plant cultivation. The species known as *ipi*, or *mandioca* (*Manihot esculenta*), and the banana (*Musa X paradisiaca*), were the species cited by the most informants (n = 10). Several authors have found that *Manihot esculenta* is an important

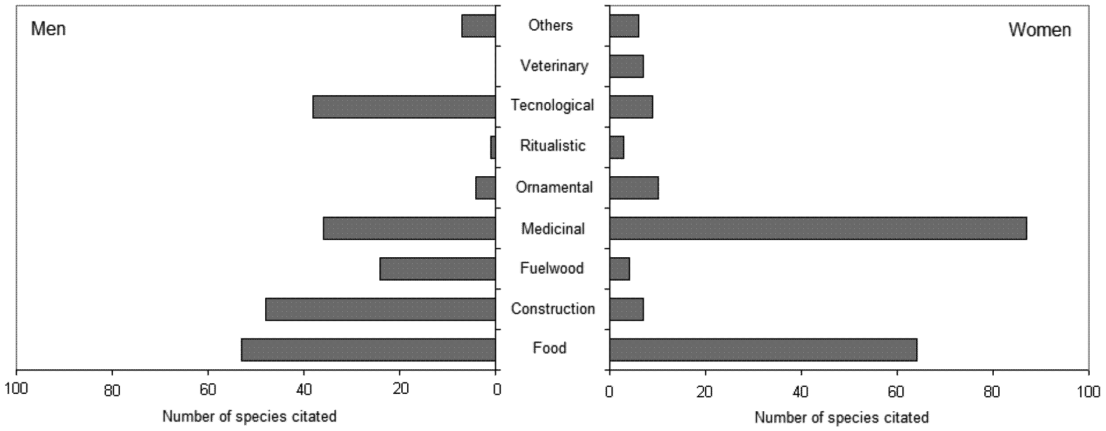

Figure 2. Distribution of the number of species indicated in each usage category by male and female informants of the Praia do Sono *Caiçara* community.

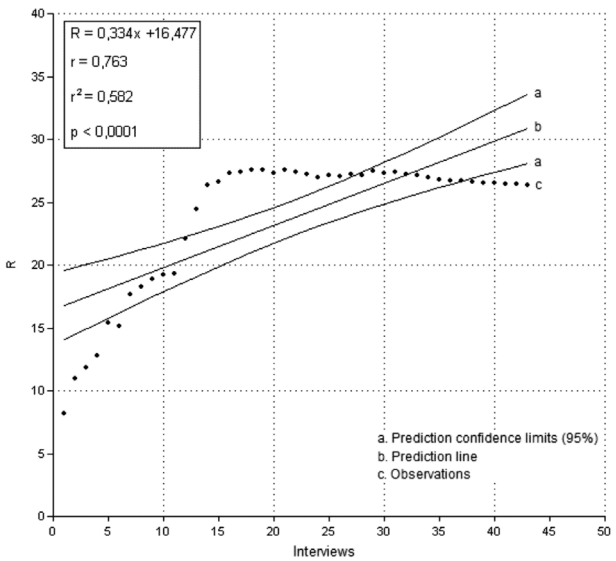

Figure 3. Graph of sampling effort related to the accumulation of species' richness according to the sequential insertion of interviews with informants from the Praia do Sono *Caiçara* community.

item in the *Caiçara* diet (Adams 2000; Hanazaki *et al.* 2000; Sanches 2004). *Euterpe edulis* is another food traditionally used by *Caiçara* communities (Sanches 2004). In this study, it was cited a significant number of times, as indicated by nine out of the 12 informants.

Of the 48 plants indicated for construction purposes, 42 were native and not cultivated by the local population. All six men interviewed, regardless of age, had a wide knowledge of the forest species used for construction, and this use is considered important in the culture and tradition of the Praia do Sono *Caiçara* community.

The traditional structure of the *Caiçara* house consists of walls of "pau-a-pique" or "estuque", sometimes whitewashed, thatched roofs and dirt floors. For the construction of walls, *Miconia cinnamomifolia* and *Pera glabrata* were the best known species, because they were cited by all informants (n = 12). Other native trees were indicated for this use, such as: *Myrcia splendens*, *Mabea brasiliensis*, *Aegiphila sellowiana*, *Rapanea ferruginea*, *Sloanea guianensis*, *Trichilia trigolia* var. *ptilaefolia*, *Sparattosperma leucanthum*, *Hymenaea courbaril*, *Edulis edulis* and *Syagrus pseudococus*. Species of bamboo were also mentioned in the context of the cross-patterned structures of the clay-covered intersecting walls; *Bambusa tuldoides* and *Phyllostachys pubescens* were the most recommended for this use. The species indicated for bracing were *Davilla rugosa*, *Anthurium* sp. and *Heteropsis salicifolia*, and *Imperata brasiliensis* as the roof coating.

The removal of wood from the forest follows certain criteria. Informants cited the optimum time as being during the waning moon, which, according to the informants, prevents the entry of insects and therefore increases its durability. It was also advised that one should not cut down the wood at the time of regrowth, because it is considered watery. This was also described by Adams (2000) in their studies of the *Caiçaras* population of the Atlantic Forest.

Often, wood extraction is in conflict with laws governing some Environmental Preservation Areas. However, it was observed that participants feel strongly, as expressed through their speech, about the importance of environmental conservation where they live: "*…if the wood that is fallen in the forest hasn't rotted, I catch it, it is better than tearing and throwing*"; "*We know that if we don't take care of our own, it may end*"; "*When we need to get wood we go into the forest, but we take off just a little, for what we need in the moment. It's not like the industries that take off all and then the forest ends*".

Twenty-four species are used as firewood for stoves, of which 19 are native and only five exotic. *Pera glabrata* was mentioned for this purpose by a larger number of respondents (n = 6).

The medicinal category contained the largest number of taxa, with a total of 89 species. This indicates the great

importance that medicinal plants play in the daily life of local specialists. Based on a review of other ethnobotanical studies undertaken in Brazil, it is possible to perceive that the medicinal category is among the most frequently mentioned (Hanazaki & Begossi 2006; Boscolo & Senna-Valle 2008). This category was analysed in detail, due to the large number of plants mentioned in this group and the wealth of cultural and botanical data obtained in the field, as can be seen in Brito & Senna-Valle (2011).

The ornamentation of houses and gardens in Praia do Sono is clearly an occupation undertaken by women. Thirteen plants were mentioned for ornamental use, of which 10 were collected in the backyards of the informants, demonstrating that the cultivation of ornamental plants in backyards is common. Eight species listed in this category were exotic, and five species from the local flora were used to decorate gardens and homes.

Only one woman informant commented about herbs used for ritualistic purposes; however, she only mentioned three species in this category: *Mimosa pudica*, *Ruta graveolens* and *Leonotis nepetaefolia*. In fact, this was not a subject openly discussed by the informants, perhaps due to prejudice or fear of discrimination. However, one informant was observed sweeping her house with a broom made from a herb known as "broom" (*Sida planicaulis*), where, while sweeping, she was softly singing a type of prayer. According to informants, they have used "since the old days of their elders" branches of *Sida planicaulis* and "rosemary broom" (*Baccharis dracunculifolia*) to clear the ground before building or planting. Although, they do not associate any ritualistic connotation with this practice.

The residents of Praia do Sono, especially women, devote part of their time to raising small animals, mainly chickens and ducks for eggs and meat production. It is very common for the juvenile chickens and ducks to be attacked by the lice that plague their nests and, to fight this disease, informants usually resorted to the use of plants. Seven vegetable species were indicated as suitable for pest control to diminish the parasites that attack chickens and ducks.

Forty species were cited in the technological category, comprising 32 native and eight exotic species. *Dendrocalamus asper* was cited by more respondents (n = 9). This species is widely utilized in the structure of the poles on which fish and clothing are dried. Moreover, they are used to make different types of crafts, as well as barrage walls to prevent sand spillage.

Other plants from the forest mentioned in this category were: *Zanthoxylum rhoifolium*, used to make wooden spoon and socket; *Bambusa trinii*, whose fibres are used to manufacture guitar strings; the wood of *Tabebuia cassinoides* and *Cecropia pachystachya*, which is employed in the manufacture of tambourines; *Sapium* sp., known as *tarumã*, used to craft boats; *Guarea macrophylla* var. *tuberculata*, which children use to make their slingshots to play; and *Tabebuia heptaphylla*, which, due to its strong timber, was used for the pestle for pounding corn and coffee.

Species in the technological category are also found in the backyards of the informants, such as *Ficus glabra*, the root of which makes a good press for making mandioca flour, and *Eugenia uniflora*, the stem of which is used to make needles for weaving fishing nets.

The *titipi*, a flexible basket made of *Heteropsis salicifolia* and used to squeeze the grated mandioca, is one of the artifacts of indigenous culture incorporated into *Caiçara* daily life. Other plants were cited as being widely utilized to manufacture baskets. The *balaios* (also baskets), which serve to carry the mandioca and other products, are produced using *Davilla rugosa*, *Anthurium* sp., *Bambusa trinii* and *Heteropsis salicifolia*. The *balainho* (a small basket), made with *Merostachys ternate*, is used as a sewing box to store utensils for stitching.

Nowadays, houses, beach huts and the church are illuminated using candles, gas lamps and generators. However, older informants mentioned the use of a *fifó*, a torch made of bamboo (*Dendrocalamus asper*) that is soaked in the oil of *Aleurites moluccana* or *Ricinus communis*.

The fishermen use ink obtained from the bark of *Schinus terebinthifolius* and *Tibouchina* sp. to make fishing nets more resistant. The bark of the both species is boiled and the liquid is poured over the net which is nested within a canoe where it remains soaking for a day and is then dried on clothe lines in a horizontal position. This procedure is undertaken whenever a new net is to be used at sea, or when an older net begins to lose its color.

The main species indicated for manufacturing canoes, which are still produced by hand by by excavating tree trunks were: *Ocotea* sp., *Cedrela* sp., *Piptadenia gonoacantha*, *Schizolobium parahyba*, *Cariniana estrellensis* and *Tachigali paratyensis*. The island communities of Cardoso (SP) and Santa Catarina (SC), according to Miranda & Hanazaki (2008), cited *Schizolobium parahyba* as the most important plant in the manufacture of canoes. Additionally, in relation to species used as tools for fishing, *Anthurium* sp., which are fairly resistant, serve as a cable to pull fishing nets, and *Phyllostachys pubescens* is used to make fishing rods. For oars, the preferred species are *Eclinusa ramiflora* and *Tabebuia cassinoides*. *Crescentia cujete* and *Cedrela* sp. are used to make bowls to draw water from canoes, and *Cecropia pachystachya* to serve as a bolster to roll the canoe in the sand. The stem of *Gynerium sagittatum* was cited as being excellent for baking fish.

The indications of "shade", "bird food" and "repellent" did not fit into any of the established categories of use. Therefore we decided to create a new category called "Others" to group plants that have a different utilization. Ten plants were placed in this category. Of these, *Mimusops commersonii*, *Terminalia catappa* and *Ficus glabra* were referred to as being useful for "shade"; *Cymbopogum nardus* and *Citrus deliciosa* as "repellent"; and *Schinus terebinthifolius*, *Clusia lanceolata*, *Eriotheca* sp. and the two species

known as *pixirica* (*Leandra melastomoides* and *Miconia dodecandra*) as "bird food". Begossi *et al.* (1993) reported that the *Caiçara* community of Ilha de Búzios (SP) is known to place the fruits of *Schinus terebinthifolius* in traps to catch the Brazilian Tanager (*Ramphocelus bresilius*) and Rufous-bellied Thrush (*Turdus rufiventris*).

From the results obtained in this study, it was concluded that the informants retain a broad knowledge of their surrounding plant resources, with which they maintain deep intimacy. The expansion of tourism and contact with residents from large urban centres are strong components in the degradation of this knowledge. Thus, its preservation, as a determinant factor in sustaining the cultural identity of this group, deserves attention and investment.

Considering that backyards play important ecological functions, while also contributing to the conservation of native species, growing plants in this space could be considered an important activity carried out by local populations in conserving the local environment.

In addition to the strong sentiment expressed by informants regarding the great value of maintaining the environment in which they live, local specialists are important players in the conservation of biological diversity, not only because of the knowledge they possess, but also because of the practices they perform. Therefore, the incorporation of their traditions regarding the uses of plant species is not only important, but is also fundamental in the *in situ* conservation strategies of the Conservation Unit.

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